



# Fresh Perspectives, Powerful Contributions

*20 Years of Achievement*



# CAENZ at a Glance...

- Not for profit organisation established as a Trust in 1987 to mark one hundred years of teaching engineering in New Zealand.
- Based at the University of Canterbury, governed by a Trust Board and Executive Committee supported by an Advisory Board comprised of senior academics and industry leaders.
- In 2006 the Centre reached an important milestone with a new partnership with the Faculty of Engineering, University of Auckland, extending its relationships with the University of Canterbury and the Institution of Professional Engineers.
- CAENZ work is funded by grants, sponsorship and income from hosting educational events such as conferences and workshops.
- Its work is delivered through a projects portfolio covering five key technology areas.
- CAENZ now acts as a national centre within the engineering and technology sectors to provide an independent and non-partisan view on major issues of the day.



## Our Mission

To advance New Zealand's development and well-being through new engineering perspectives, analysis and a broader understanding of emerging issues in engineering and related technologies.

## Our Roles

### *CAENZ as a Think-Tank*

Foremost among the roles for CAENZ is the role of the think-tank. CAENZ facilitates the cross-pollination of knowledge across disciplines and institutional boundaries, as well as contributing to projects of national importance.

### *CAENZ as an Integrator*

CAENZ plays a strong integrating role within New Zealand's engineering and technology sectors. Our work is characterised by networking and collaboration which, through broad participation, is addressing some of the most difficult challenges of our time.

### *CAENZ as an Awareness Raiser*

CAENZ provides expert commentary and interpretation on major issues of the day, and highlights the vital importance of engineering thinking and technological advance for a strong and growing society.

## How we Operate

With a focus on people and participation, strong partnerships are an imperative:

- We have an experienced and effective team which coordinates our work programmes through networks of collaborators. We have a proven ability to build and manage relationships, to establish inter-connected groups, and to communicate effectively with a diverse group of stakeholders.
- Our collaborators work with us to learn, extend networks and find new synergies and solutions for innovation.
- CAENZ has become a highly effective vehicle for progressing knowledge. We are committed to maintaining our national standing as an independent and non-partisan voice on engineering and technology matters.

## The value of CAENZ's unique positioning

CAENZ was built on a vision of increasing this country's technical knowledge for the benefit of all New Zealanders. This CAENZ has done consistently and successfully since its foundation in 1987. In the recent past, the accelerating pace of the unfolding 'technology revolution' has increased the importance of our mission for CAENZ and for New Zealand.

As an independent non-partisan body with extraordinary access to technical knowledge, CAENZ occupies a unique position in New Zealand's institutional landscape. It offers a unique contribution in helping transform New Zealand's technology infrastructure to meet the challenges of the future.

CAENZ has become increasingly involved in facilitating projects which extend conventional engineering boundaries. We set out to ensure the outcomes we undertake will leave a unique footprint. In essence this means we undertake those projects that are best done collectively rather than by individuals.

Our reputation as an honest broker allows us to establish projects in many situations that might otherwise become too difficult because of conflicting commercial and/or professional interests. We are able to encourage and facilitate collaborative action where independence and objectivity are essential.

There's an art in getting people to come together and produce the right mix of energy and insight to find solutions. It is not just about technical ability. This is what CAENZ does.

Calling on academic and industry expertise, we offer the means for professionals to come together across a wide discipline base which invariably leads to important advances in shared knowledge and understanding. By advancing solutions that create new perspectives, we aim for impact that will make real change to New Zealand's economic and social progress.

## Powerful Contributions

CAENZ has always been concerned with outcomes – leveraging off our unique position to create new ways of doing things and delivering the robust analysis and critical thinking that challenges and transforms. We contribute by anticipating significant emerging issues and bringing ideas and information together that creates new insights and solutions that bring changes to the world outside the Centre.

CAENZ's major projects have delivered real benefits to the community. An outcome of our project activity over the last 20 years is provided in the attached Figure and Projects History. These projects are characterised by their ambitious aims and forefront thinking at the time of project execution.

Projects provide an important opportunity for extending networks and finding new synergies and solutions for innovation. All the collaborators who work with us on a project return to their normal professional lives with new relationships, ideas and learning at their disposal.

At the core of our project activity is the application of engineering knowledge and insight to facilitate the contribution that engineering perspective can make to the major issues of the day. The following pages document outputs and known outcomes from a selection of CAENZ major projects over the past twenty years.

# Project 1: Lifelines

The 1990/91 *Lifelines in Earthquakes – Wellington Case Study* was CAENZ's first major project. The Study aimed to assess the vulnerability of infrastructure lifelines, identify mitigation measures and raise awareness among lifelines managers of discovered vulnerability.

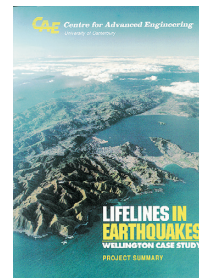
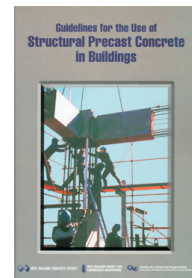
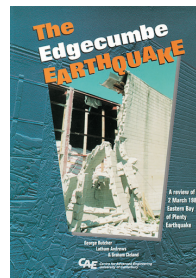
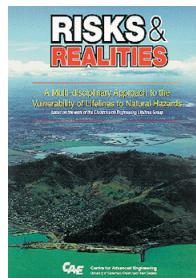
## TIMELINE

- 1990 Lifelines in Earthquakes
- 1992 Seminar on Lifeline Services in Earthquakes (Prof. Tom O'Rourke)
- 1995 Wellington After the 'Quake – The Challenge of Rebuilding Cities (Conference)
- 1996 Risk and Realities: A Multi-disciplinary Approach to the Vulnerability of Lifelines to Natural Hazards
- 1997 The Edgecumbe Earthquake Review
- 2001 Seminar on Natural Hazard Management
- 2004 Planning for Natural Hazards in the Built Environment
- 2005 Managing Flood Risk: Draft New Zealand Protocol
- Resilient Infrastructure (Conference)

*Guidelines for the Use of Structural Precast Concrete in Building*

first edition 1991  
second edition 1999

The August 2005 “Resilient Infrastructure Conference” brought to New Zealand for the first time the concept of resilience and the ability of communities as a whole to survive natural disasters and major human-induced disruption. The conference brought together leading specialists to help explore and understand the vital interactions between lifelines, social dynamics and economic activity.



## Project 1 – selected outputs

### *Positive Outcomes and Benefits*

- The original lifelines project, although focused in Wellington, was applicable to all urban centres within New Zealand. Ongoing study groups have since been established throughout the country under the umbrella of Lifelines New Zealand.
- The use of systems approaches, to improve understanding of the connections and interdependencies that govern infrastructure investment, now forms the basis for much of today's modern practice for upgrading disaster readiness in New Zealand.
- Government, business and the public at large have a collective interest in ensuring that the flow of infrastructure services continues in the face of a broad range of shocks. CAENZ programmes continue to inform government policy in regulatory development in this vital area.

### *Where We are Going*

CAENZ is a leader in developing a more thorough understanding of the vulnerability of New Zealand's built environment to natural hazards. The Draft Flood Management Protocol provides a decision-making framework and methodologies through which flood risk can be addressed in an integrated and holistic way. This philosophy has now been further developed in respect of a new approach looking at the hazards facing New Zealand communities in geotechnical risk.

CAENZ is also sponsoring the visit to New Zealand during 2007 of Prof Tom O'Rourke under a Fulbright Senior Specialist Programme to assist with a major inter-agency research project to assess the technical and institutional requirements for strengthening infrastructure resilience. This project aims to establish new approaches and models to guide policy development and further practice in this country.



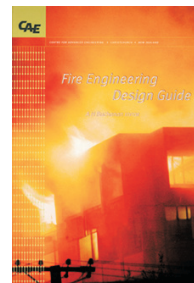
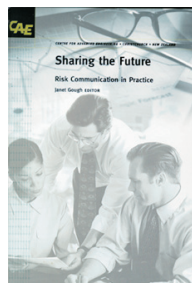
## Project 2: Risk Management

Two international conferences in 1997 brought together the knowledge and experience of a diverse range of international contributors on integrated risk management practice. The interactions and discussion at these events have formed the basis of CAENZ risk management activity and its ongoing contributions to professional practice.

### TIMELINE

- 1997 NZ Integrated Risk Management Conference
- 1998 Owing the Future publication
- 2000 Management of Engineering Risk (Jointly with IPENZ)
- 2000 Conference: The Risk Communication Challenge: Issues Techniques and Practice.
- 2002 Conference: The Contract in Successful Project Management
- 2002 Risk Communication Workshop (jointly with NZ Society of Risk Management/Dr Caron Chess, visiting Fulbright scholar)
- 2003 Workshop: Integrating Risk Management Processes into Project Management
- 2004 Risk Communication Workshop Series
- 2005 Current Imperatives for Risk Management in New Zealand

The release in early 2007 of CAENZ's latest publication, *Challenging the Future: Connecting the Words in Risk Communication*, continues the Centre's contributions towards assisting practitioners and organisations to achieve best practice in all aspects of risk management. Risk communication is an ongoing discipline which has become increasingly important in today's environment where consultation and shared responsibility is expected.



### Project 2 – selected outputs

### *Positive Outcomes and Benefits*

- Risk management has become a key decision-making tool in many sectors of industry and throughout the public sector. CAENZ is recognised for bringing to New Zealand the latest international research to practitioners and organisations alike.
- CAENZ publications and seminars are widely recognised as important learning opportunities, providing practical resource material and case study examples to assist New Zealand practitioners to achieve best practice.
- The shared experiences of those who contribute to the CAENZ Risk programme has resulted in explicit recognition of risk communication in the development of the Australian and New Zealand Risk Management Standard, AS/NZS 4360.

### *Where We are Going*

Risk management is now widely used as a decision-making tool. Through bringing together systems thinking and risk assessment techniques, developed from engineering practice, CAENZ projects offer integrated approaches to solving complex issues. The Centre is also helping to communicate risk management outcomes in ways that are meaningful to the practitioner and non-specialists alike. New projects under consideration include examining the different contexts that shape risk management decisions and further international contributions on dealing with uncertainty in novel applications. A review of the 2001 “Fire Engineering Design Guide” book is also under active consideration.



## Project 3: Modernisation of the NZ Electricity System

The 1992 project *Reliability of Electricity Supply* brought together a multi-disciplinary group of professionals from throughout the country to analyse the downstream aspects of supply reliability as it affects customers, electricity retailers, generators, and transmission and distribution network operators. The methodologies recommended by the study team have had a significant influence on national reporting standards.

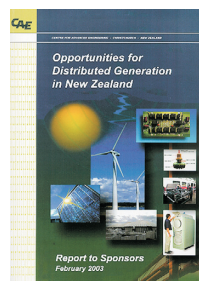
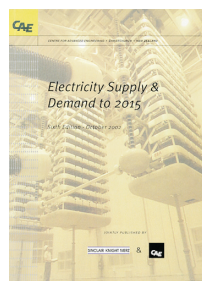
### TIMELINE

|           |   |
|-----------|---|
| 1992      | Reliability of Electricity Supply   |
| 1992-2002 | Electricity Supply and Demand to 2015 (a series of six independent forecasts in collaboration with Leyland Consultants)   |
| 2003      | Distributed Generation: a Study of Opportunities  |
| 2004      | Energy21 News: publication of a new journal for Distributed Energy resources.   |
| 2005      | Diesel Genset Applications Guide for Distributed Generation Investment  |
| 2007      | The Economic and Systems Impacts of Increased Distributed Generation Connection within New Zealand's Electricity Network. |

### *Seminars in association with the Electricity Engineers' Association*

|      |   |
|------|---|
| 2002 | DG Opportunities for NZ                         |
| 2003 | Market Development and Investment Opportunities |
| 2004 | Mainstreaming DG                                |
| 2005 | Implementing NZ's DG options                    |
| 2006 | DG and the Consequences for NZ's Power Systems  |

Energy21 is the collective name for an industry-led initiative delivered by CAENZ to promote systems level modernisation of New Zealand's electricity system. Comprising a wide group of industry participants, Energy21 acts to promote and encourage cost-effective DG solutions through policy-based research, demonstration projects and seminars.



## Project 3 – selected outputs

### *Positive Outcomes and Benefits*

- The Electricity Commission has adopted the methodology (updated) for measuring the value of lost load (VoLL) as a component of the industry grid investment tests. Recommendations arising from the 1992 study for the establishment of a national reporting scheme on reliability statistics for power companies were also adopted.
- More than a dozen international speakers and contributors have been brought to New Zealand. These contributors have played a major part in bringing Distributed Generation opportunities to the forefront of industry responses to the need for a more diverse energy supply system for the country.
- Individual participants in the CAENZ programmes and Energy21 have championed the establishment of a New Zealand National Committee of CIGRE\*, providing a conduit for the latest international research and experience to the sector.

### *Where We are Going*

Networking and communication is a key to unlocking value within the New Zealand electricity sector through reconfiguration and improvement of the electrical system. CAENZ's distributed generation programme and its support for Energy21 and CIGRE are aimed at advancing broad-based economic and technical perspectives on electricity supply issue. A new report now being prepared will be published in the CAENZ Commentary Series, which will offer a fresh analysis of the emergent DG market place.

There is also a new study and Commentary currently in progress on the network implications of increased DG connections. The annual EEA workshop series continues this year with CIGRE participation for the first time, and with a renewed focus on system security issues. Industry engagement is the cornerstone of these programmes.

\* CIGRE is the International Council on Large Electric Systems

## Project 4: Achieving a Sustainable Energy Future

The publication in 1996 of the two volume compendium *Energy Efficiency: a Guide to Current and Emerging Technologies* represented the culmination of three years' effort by a veritable 'who's-who' of the New Zealand energy management fraternity. The study included seven task groups covering domestic buildings, commercial and institutional buildings, transport, primary production, forest processing, food processing, and manufacturing and metals.

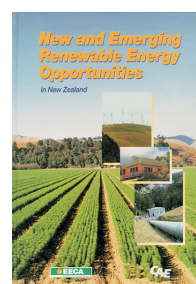
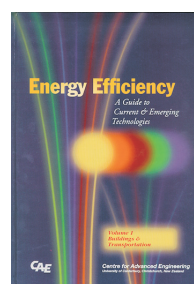
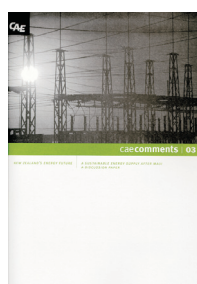
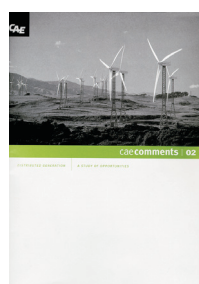
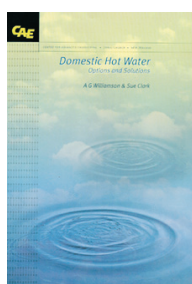
### TIMELINE

|      |   |
|------|---|
| 1993 | Energy Efficiency Project                                       |
| 1996 | New and Emerging Renewable Energy Opportunities                 |
| 2000 | Possible Energy Use Trends for New Zealand 2000-2010            |
| 2001 | Domestic Hot Water: Options and Solutions                       |
| 2004 | Southland Lignite Opportunities Study                           |
| 2005 | The Role of LNG in the New Zealand Thermal Fuels Market         |
| 2005 | Renewable Energy Survey   |
|      | Southland Dairy Shed Efficiency (ongoing)                       |
| 2006 | Potential Vulnerabilities for Energy Supply in the Otago Region |
|      | Canterbury Regional Energy Strategy Project                     |

### CAENZ Comments

|      |  |
|------|--|
| 2003 | New Zealand's Energy Future: A Sustainable Energy Supply After Maui  |
| 2004 | Energy Supply in the Post Maui Era: An Investigation into Thermal Fuel Options and their Contribution to Energy Security |

The 2006 Canterbury Regional Energy Strategy Project reflects the considerable shift in focus that has occurred in energy planning since CAENZ's first contributions to the field. Today energy has become both a national and a local issue. There is a growing body of evidence and research that suggests that 'community' energy offers a serious alternative to our centralised energy system. This study, whilst still ongoing, seeks to achieve a balanced perspective on the critical energy issues facing the Canterbury Region and through new collaborative arrangements provide a road map for future regional action.



## Project 4 – selected outputs

### *Positive Outcomes and Benefits*

- Seminal contributions that define the state-of-the-art in energy efficiency technologies and their potential to contribute to demand side management in this country. More than ten international experts in this field of energy efficiency and supply have participated in various fora to promote the interchange of ideas and opinions with their New Zealand counterparts.
- The two CAENZ Commentaries, plus their related studies, continue to have a major impact on policy development in regard to security of energy supply in the post-Maui era. Government action to promote exploration of oil and gas reserves has recognised the strategic imperative to New Zealand of extending this country's primary energy resource base so as to restore inventories and thus enable investment in alternative sources.

### *Where We are Going*

CAENZ continues to bring together the knowledge and capabilities to create new opportunities for sustainable energy technologies. A current examination of biomass gasification opportunities for two enterprises in the South Island, plus the Southland Dairy Efficiency Project, reflects this commitment.

This is a critical area where New Zealand must build institutional knowledge. With good technical understanding and early recognition of international trends, CAENZ helps facilitate adoption of these technologies. CAENZ is also committed to supporting the Otago-led National Energy Research Institute (NERI), which proposes a Centre of Excellence to promote the uptake of alternative energy technologies for New Zealand.

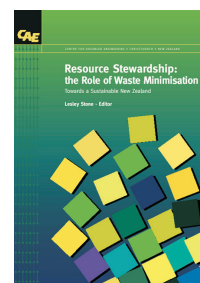
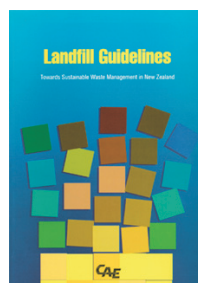
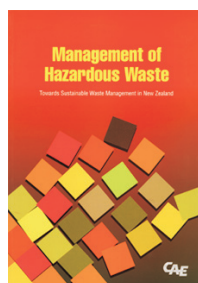
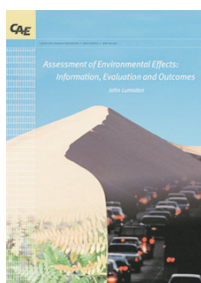
## Project 5: Resource Stewardship/Waste Minimisation

The aim of the 1990/92 major project “Our Waste: Our Responsibility” was to contribute to better waste minimisation in New Zealand through the publication of guidelines that reflect best international practice. The final 460 page report was launched at a function held at the Beehive in Wellington.

### TIMELINE

- 1992 Meeting New Zealand’s competitive edge through cleaner production proficiency: Don Hussingh seminar
- 1995 The Environmentally Educated Engineer: publication of workshop proceedings
- 2000 Landfill Guidelines: Towards Sustainable Waste Management in New Zealand
- 2002 Management of Hazardous Waste: Towards Sustainable Waste Management in New Zealand.
- 2001 Assessment of Environmental Effects in New Zealand: information, evaluation and outcomes.
- 2003 Resource Stewardship and Waste Minimisation: Towards a Sustainable New Zealand
- 2004 Energy from Waste: Putting Resources to Productive Use

The goal of CAENZ’s Resource Stewardship and Waste Minimisation project is to advance environmental sustainability in New Zealand by sharing knowledge, experience and tools to improve waste management practice and the level of resource stewardship in this country. CAENZ continues to take an active interest in advancing a deeper understanding of the underlying issues of sustainability and resource efficiency.



### Project 5 – selected outputs

### *Positive Outcomes and Benefits*

- As a result of the Our Waste: Our Responsibility project the Ministry for the Environment set up a Cleaner Production Task Force to promote cleaner production techniques to local companies. In addition, the Wellington City Council established the Cleaner Production Association to extend and promote the concept.
- The Landfill Guidelines and Management of Hazardous Waste publications have become industry standards in New Zealand, providing practical guidance to landfill owners, operators and regulatory authorities.
- In the last decade waste minimisation has moved from a theoretical concept to being recognised as an important part of waste management in New Zealand. CAENZ's promotion and encouragement of the concept has helped create the partnerships and collaborations that support the New Zealand Waste Strategy: a joint MfE and Local Government New Zealand initiative.

### *Where We are Going*

The long term challenge for waste management is to break the present link between the amounts of waste produced and the rate of economic growth. This requires a change of direction that includes 'closing the loop' on resource use and waste generation. CAENZ, through its Sustainable Technologies platform, seeks to promote the transition to more sustainable communities and the wiser use of our resources through accessing know-how and technology and making the critical 'sustainability connections', so as to create the opportunity to do things differently.



## Our Programmes Today

New Zealand has great opportunities. It also faces significant challenges. Pivotal to securing New Zealand's future are access to resources and modernisation of New Zealand's infrastructure systems. We underpin our work with a commitment to forefront research, and the evidence to inform decision-making and public policy.

Our five technology platforms are related to these areas:

### Technologies for Sustainability

CAENZ seeks to advance early adoption of innovation, best practice, resource stewardship and technology application by collaborative action on identified knowledge gaps, and raising awareness of the underlying technology and science opportunities. This programme has produced an extensive list of studies, research projects, publications, expert commentary, and on-going work in areas such as hazardous waste minimisation and energy futures.

### Infrastructure systems

Our programme focuses on the essential systems and infrastructure that underpin a modern society. CAENZ is a leader in developing a more thorough understanding of the vulnerability of local infrastructure to natural hazards, and development of engineering solutions. The use of systems approaches to improve understanding of the connections and inter-dependencies that govern infrastructure investment forms the basis for ongoing activity within this area. Key outcomes include engineering lifelines activities, new guidelines for fire engineering and reinforced concrete construction and on-going activities around infrastructure resilience.

A vital additional component is ensuring a robust and cost-effective built infrastructure. CAENZ publishes an annual series of Performance Indicators to better inform the sector of where opportunities lie for performance improvement, and supports alternative methods of procurement in the construction industry.

### Risk Management

Risk management is now widely used as a decision making tool. Through bringing together systems thinking and risk assessment techniques developed from engineering practice, CAENZ projects offer integrated approaches to solving complex issues. We are also helping to communicate risk management outcomes in ways that are meaningful to the practitioner and non-specialist alike. Programme outcomes include seminars, workshops and major publications.

### Oceans

New Zealand is claiming exclusive rights to the fourth largest area of ocean in the world. Enormous national assets are at stake, including minerals and hydrocarbons, fish and other biological assets, along with potential in areas such as biotechnology and ocean tourism. Our vision is to see New Zealand recognised as a world leader in oceans management. Our work in this area has resulted in a national conference and major contributions towards national policy development. We continue to play our part by promoting increased understanding and research around the ocean's development.

### Emerging Technologies

CAENZ is acting as a catalyst for enabling New Zealand organisations to achieve world-class delivery or best practice. We do this through providing insight into specific areas of expertise, and research relevant to current industry capability. Our aim is to bring together ideas and new opportunities for collaboration, and to lift industry/university linkages to new levels of research excellence and investment. We have organised a series of education events on this subject and continue to foster innovation and novel applications.



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Printed February 9, 2007